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Titanomagnetites with Magnetite–Ulvospinel breakdown structures. Coercive properties: modeling and experiment

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Abstract

© 2015, Pleiades Publishing, Ltd. One-, two-, and three-dimensional models of magnetite–ulvospinel exsolution structures are constructed based on the experimental data. The models describe the zero state and the state of remanent saturation magnetization. A distinctive feature of these models is the calculation of the magnetostatic interaction between the ferromagnetic matrices of magnetite separated by paramagnetic ulvospinel lamella. The critical sizes of matrix transition from a single-domain to two-domain state are calculated. Based on the calculations, it is concluded that the matrices can only have a singleor two-domain structure. The ratios Mrs/Ms for the matrices of various sizes and the dependences describing the growth in the induced magnetic moment Mi in the fields of up to 25 mT are calculated. The sizes of the exsolution structures in two samples are estimated by electron microscopy. The values observed in the experiments closely agree with the predictions by the suggested models.

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Keywords

energy of interaction, magnetic state modeling, magnetite, size of exsolution structures, titanomagnetite breakdown, ulvospinel